

EPA Region 5 Records Ctr.



355371



## **Criteria Analysis Memorandum**

Operable Unit 2 (Deposit DD), Operable Unit 3,  
Operable Unit 4, and Operable Unit 5 (River Mouth)

Lower Fox River and Green Bay Superfund Site

February 2010

# Criteria Analysis Memorandum

for

**Operable Unit 2 (Deposit DD), Operable Unit 3, Operable Unit 4, and  
Operable Unit 5 (River Mouth)**

**Lower Fox River and Green Bay Superfund Site**

## Introduction

This evaluation supports an Explanation of Significant Differences for Operable Unit 2 (Deposit DD), Operable Unit 3, Operable Unit 4, and Operable Unit 5 (River Mouth) of the Lower Fox River and Green Bay Superfund Site, February 2010 (the "2010 ESD"). The evaluation confirms that the 2007 ROD Amendment Remedy remains the preferred remedy based on an assessment of key remedy selection criteria identified in the National Contingency Plan, despite a significant increase in the estimated cost of that remedy since issuance of the 2007 ROD Amendment.

The 2007 ROD Amendment estimated the cost of the selected remedy at \$390 million in 2005 dollars (which translates to \$432 million in 2009 dollars), in reliance on information presented in a 2006 Basis of Design Report ("BODR"). A more recent cost estimate prepared as part of the remedial design process projects that the selected remedy will cost \$701 million in 2009 dollars. Thus, when the two cost estimates are compared on an equal basis (in 2009 dollars), the estimated cost of the selected remedy has increased by approximately \$269 million.

In light of the increased cost of the 2007 ROD Amendment Remedy, as described in the 2010 ESD, this memorandum re-evaluates three previously-evaluated remedial options:

1. Dredging Remedy. This remedial approach was selected in the 2003 ROD and re-evaluated in the 2007 ROD Amendment. It would require dredging and off-Site disposal of an estimated 7.1 million cubic yards of contaminated sediment. The cost of that remedial alternative currently is estimated at \$957 million (in 2009 dollars).
2. 2007 ROD Amendment Remedy. This remedy was selected in the 2007 ROD Amendment and discussed in the 2010 ESD. With refinements made during the design process, the remedy would include dredging and off-Site disposal of more than 3.5 million cubic yards of contaminated sediment, placing engineered caps over up to 369 acres, and placing sand covers over up to 197 acres of River bottom at the Site. As noted above, the cost of the 2007 ROD Amendment remedy is estimated at \$701 million (in 2009 dollars).
3. Capping Remedy. This remedial approach was evaluated in the 2002 ROD and the 2003 ROD. Under this remedial approach, most of the contaminated sediment would be contained in place using engineered caps. Some areas would still need to be dredged at least partially, including at least 150 acres of the federally-authorized navigation channel, four acres just north of the De Pere Dam

where frazil ice forms during cold weather, and areas where minimum water depth requirements for capping could not be met. The cost of that remedial alternative is estimated at \$484 million (in 2009 dollars).

## Background

This re-evaluation draws upon the Response Agencies' findings and conclusions from prior remedy development and refinement efforts and prior experience with dredging, capping, and sand placement at the Site. The prior remedy development and refinement efforts include: (1) preparation of remedial investigation and feasibility study reports for the Site; (2) remedy evaluation work associated with the 2002 ROD, 2003 ROD, BODR, 2007 ROD Amendment, and 2008 ROD Amendment; and (3) oversight of potentially responsible parties' remedial design efforts. The Response Agencies' prior experience with dredging, capping, and sand placement at the Site has included overseeing and assessing the results of: (1) two dredging demonstration projects in discrete areas of the River between 1998 and 2000; (2) extensive dredging, capping, and sand placement work in OU1 between 2004 and 2009; (3) dredging work performed for the 2007 Phase 1 remedial action in OU 4; and (4) dredging, capping, and sand placement work done in 2009 for Phase 2 of the remedial action in OUs 2 - 5. Based on those prior efforts, the Response Agencies have identified several guiding principles that are relevant to this re-evaluation:

- Dredging, capping, and sand covering are all feasible and they all can be effective in reducing the risks posed by PCB-contaminated sediments at the Site.
- Unlike capping and sand covering, dredging removes targeted PCBs from the River and places the contamination in a well-controlled upland disposal facility.
- Engineered caps are meant to contain PCB-contaminated sediment in place on a permanent basis, but ensuring permanent protection may require cap maintenance, cap enhancement, or cap removal over the long term. Although some predictions can be made from modeling and recent cap placement efforts at the Site, the long-term costs and benefits of capping are less certain than the long-term costs and benefits of dredging.
- Engineered caps also may limit River use and navigability particularly if placed in a navigational channel, in shallow areas, or in other areas if water levels decline in the future.
- Sediment with higher PCB concentrations may pose greater risks, so the need for remedy permanence and long-term effectiveness increases when targeting areas with more concentrated contamination.
- Sand covering dilutes contaminated sediment and helps reduce PCB concentrations, but it does not remove or isolate the PCB contamination. For that reason, the Response Agencies have only allowed sand covering in undredged areas that have a relatively thin layer of PCB contamination at a concentration of no more than 2.0 ppm PCBs (*i.e.*, twice the 1.0 ppm Remedial Action Level).

In light of those considerations, the 2007 ROD Amendment (for OUs 2 - 5) and the 2008 ROD Amendment (for OU 1) both classified dredging as the "Primary Remedial Approach" to be used at the Site. Capping and sand covering were classified as less-preferred "Alternative Remedial Approaches" that can be used only if specified criteria are met.

The criteria for use of "Alternative Remedial Approaches" under the 2007 ROD Amendment and the 2010 ESD also incorporate relative cost and cost-effectiveness considerations, and the Response Agencies have continued to evaluate those considerations in light of new information, including information collected in the OU 2 - 5 remedial design process. Among other things, the Response Agencies have identified the following cost-related considerations that are relevant to this re-evaluation:

- Dredging costs depend largely on the *volume* of sediment removed (such as the number of cubic yards dredged and processed). In contrast, capping costs depend largely on the amount of *area* that is being capped (such as the number of acres capped). Thus, as highlighted below, the cost effectiveness of dredging and capping varies with the conditions in different areas at the Site.
- Dredging is particularly cost effective in areas that have moderate to high PCB concentrations at or near the surface, and in areas with moderate to high contamination that runs from the surface to a given depth. Dredging is less cost effective for deeply-buried contamination that is covered with comparatively clean sediment. In such areas, much of the cost would be incurred in dredging and processing the cleaner sediment that would need to be removed along with the deeply-buried contamination. Additionally, deeply-buried contamination is less likely to be scoured, re-exposed, and released.
- Capping may be more cost effective than dredging in some areas, such as areas with thicker deposits of low-level sediment contamination, or areas with contamination covered by relatively clean sediment. Capping is less cost effective than dredging in larger areas with a thinner layer of surface sediment contamination, even if the contamination is only at relatively low concentrations.

### **Criteria Evaluation**

The National Contingency Plan ("NCP"), codified at 40 C.F.R. Part 300, specifies nine evaluation criteria for CERCLA remedy selection decision-making. The 2003 ROD and the 2007 ROD Amendment for OUs 2 - 5 included evaluations of all of those nine criteria. A new evaluation of most of those criteria would not change the prior evaluations, so this re-evaluation focuses on two of the NCP's "primary balancing criteria" that are most important for the current comparison, given the increased cost estimate for the selected remedy as described in the 2010 ESD. The following remedy selection criteria are re-evaluated in this memorandum:

1. Long-term effectiveness and permanence: Alternatives are assessed for their ability to maintain protection of human health and the environment over time, and for the reliability of such protection.
2. Cost: The cost of each alternative is assessed, including each alternative's

capital cost, annual operation and maintenance ("O&M") cost, and net present value of capital and O&M cost. Net present value is the total cost of an alternative over time in terms of today's dollars.

This memorandum re-evaluates those two criteria for three remedial alternatives described above: a Dredging Remedy; the 2007 ROD Amendment Remedy; and a Capping Remedy.

### 1. Long-Term Effectiveness and Permanence

To judge a remedial alternative's long-term effectiveness and permanence, the NCP requires an assessment of the "[m]agnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities" as well as the "[a]dequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste." 40 C.F.R. 300.430(e)(9)(iii)(C). That must include "the assessment of the potential need to replace technical components of the alternative, such as a cap..." 40 C.F.R. 300.430(e)(9)(iii)(C)(2).

Although all three of the alternatives would meet the minimum requirements for long-term protectiveness and permanence under the NCP, there are pertinent differences between the alternatives. All three of the remedial alternatives would leave some PCBs in OUs 2 - 5, but capping – by design – leaves significantly more PCBs in place than dredging.

The long-term risk associated with leaving PCBs at the Site depends in large part on the amount and concentration of the remaining PCBs. As noted in Table 7 of the 2007 ROD Amendment, there is a total of approximately 21,400 kilograms ("kg") of PCBs in the sediment in OUs 2 - 5 that exceeds the 1.0 ppm PCB Remedial Action Level ("RAL"). The following table summarizes the amount and concentration of PCBs that would remain in OU 2 - 5 remediation areas under the three alternatives:

Remedial Alternative	Approximate PCB Mass Removed	Post-Remedy PCB Mass Remaining in OUs 2 - 5	Expected Concentration and Areal Extent of Remaining PCBs
Dredging Remedy	18,400 kg	3,000 kg	- Low to moderate concentrations (in dredge residuals and sand cover areas)
2007 ROD Amendment Remedy	13,700 kg	7,700 kg	- Low to moderate concentrations (in dredge residuals and sand cover areas) - Limited low, moderate, and high concentration areas (in up to 369 acres of capped areas)
Capping Remedy	3,550 kg	17,850 kg	- Significant low, moderate, and high concentration areas (in sand cover areas and in more than 1,170 acres of capped areas)

The long-term risk of leaving PCBs at the Site also depends on the durability of any systems used to contain residual PCBs, such as engineered caps. Although the cap designs for this Site are based on extensive modeling efforts and added safety factors, the long-term needs for cap maintenance, cap enhancement, and potential cap removal cannot be predicted with certainty at this time. Some cap maintenance is expected. Any cap failure could re-expose contaminated sediment left in place at the Site and reduce the remedy's long-term effectiveness and permanence.

In light of those considerations, the Response Agencies have determined that greater use of dredging guarantees greater long-term effectiveness and permanence while greater use of capping offers less long-term effectiveness and permanence. Among the three alternatives being re-evaluated here, the Dredging Remedy would provide the highest level of long-term effectiveness and permanence, the 2007 ROD Amendment Remedy would provide the next highest level, and the Capping Remedy would provide the lowest level of long-term protection.

## 2. Cost

The Response Agencies have re-evaluated the costs of various remedial alternatives based on information received since issuance of earlier decision documents for the Site. The following table summarizes the current estimated costs of the three remedial alternatives re-evaluated here. The table also identifies the degree of uncertainty associated with each remedy cost estimate.

Remedial Option	Estimated Cost (in 2009 dollars)	Cost Uncertainty
Dredging Remedy	\$957 million	Low to Moderate
2007 ROD Amendment Remedy	\$701 million	Low to Moderate
Capping Remedy	\$484 million	Moderate to High

The estimated cost totals are taken from a more detailed cost analysis spreadsheet that is attached to this memorandum.

As noted in the table above, the cost uncertainty for the two dredging-oriented alternatives (the Dredging Remedy and the 2007 ROD Amendment Remedy) is less than the uncertainty for the Capping Remedy. The cost uncertainty for the two dredging-oriented remedies is identified as "Low to Moderate" because the costs at this Site for dredging, processing, and disposing of contaminated sediment have been fairly well-established from past experience and the dredging plans are now in an advance stage of design. Much like the dredging costs, the costs of initial cap placement work have been fairly well-established by past experience at the Site. In contrast, the future costs of cap maintenance and potential cap enhancement or cap removal are highly uncertain. The capping cost figures used here are reasonable low-end estimates; they are unlikely to go down, but they could increase significantly. Due to the differences between the 2007 ROD Amendment Remedy (which employs limited capping, mostly for deeply-buried sediment deposits and deposits with low to moderate contaminant levels) and the Capping Remedy (which employs widespread capping), the overall uncertainty and risk of major cost increases are higher for the Capping Remedy. Thus, the cost uncertainty for that alternative is identified as "Moderate to High" in the table.

## **Overall Evaluation and Conclusion**

Based on their prior remedial alternative evaluations and the focused re-evaluation summarized above, the Response Agencies have determined that the 2007 ROD Amendment Remedy, with the changes described by the 2010 ESD, is the preferred remedy for OUs 2 - 5, despite the increased cost estimate discussed in the 2010 ESD.

From an overall perspective, the 2007 ROD Amendment Remedy is the most cost-effective alternative because it balances and combines the long-term effectiveness and permanence advantages of dredging and the potential cost saving advantages of capping and sand covering in particular areas. Refinements during the remedial design process are expected to yield a final design that incorporates an optimized combination of dredging, capping, and sand covering, based on area-specific conditions.

The Dredging Remedy alternative may provide somewhat greater long-term effectiveness and permanence benefits than the 2007 ROD Amendment Remedy (due to its greater use of dredging), but the estimated cost of the Dredging Remedy is higher and that remedy has other disadvantages. For example, as noted in the 2007 ROD Amendment and the attached detailed cost analysis, the Dredging Remedy would take longer to implement (14-15 years) than the 2007 ROD Amendment Remedy (9 years), so the Dredging Remedy is less advantageous from a short-term effectiveness standpoint.

Using reasonable low-end cost estimates for capping costs, the Capping Remedy would be less costly than the 2007 ROD Amendment Remedy, but it would provide less long-term effectiveness and permanence (due to its use of widespread capping as a PCB containment strategy). The potential cost savings from any increased use of capping also is uncertain. The Capping Remedy clearly would be less costly than the 2007 ROD Amendment Remedy in the short term, but the total cost of that alternative may approach or exceed the cost of the 2007 ROD Amendment Remedy if major cap maintenance, cap enhancement, and/or cap removal are required over the long term. On balance, the 2007 ROD Amendment Remedy is more beneficial and more cost-effective given the long-term uncertainties associated with widespread capping at the Site.

In conclusion, the Response Agencies have determined that the remedy selected in the 2007 ROD Amendment, with the changes described in the 2010 ESD, is the preferred remedial alternative under the primary balancing criteria specified by the NCP. That alternative also will be protective of human health and the environment, it will comply with federal and state requirements that are applicable or relevant and appropriate to this remedial action, and it will satisfy the NCP's criteria for State and community acceptance.

**Project Remedy Comparisons  
2007 Amended Remedy vs Dredging Remedy vs  
Cap/Cover Remedy  
Prepared by: The Boldt Company  
Dated: February 17, 2010**

	B	C	D	E	F	G	H	I	J	K	L	M
<b>Table 1: Volume 2's Quantities</b>	2007 Amended Remedy Primary Dredge	2007 Amended Remedy Residual Dredge	2007 Amended Remedy Residual Cover	2007 Amended Remedy Cap A	2007 Amended Remedy Cap B	2007 Amended Remedy Cap C	2007 Amended Remedy Shoreline Cap	2007 Amended Remedy Cover	2007 Amended Remedy Sub Total			
Volume	3,566,400 cy	230,000 cy	403,333 cy	1,586,236 cy	576,813 cy	895,442 cy	130,387 cy	317,827 cy	7,706,438 cy			
Area	757.5 acres	142.6 acres	250.0 acres	183.7 acres	66.8 acres	103.7 acres	15.1 acres	197.0 acres	1,323.8 acres			

	2007 Amended Remedy Primary Dredge	2007 Amended Remedy Residual Dredge	2007 Amended Remedy Residual Cover	2007 Amended Remedy Cap A	2007 Amended Remedy Cap B	2007 Amended Remedy Cap C	2007 Amended Remedy Shoreline Cap	2007 Amended Remedy Cover	2007 Amended Remedy Sub Total	Balance of 2007 Amended Remedy Project Budget	Total 2007 Amended Remedy Project Budget
<b>Table 2: 2007 Amended Remedy</b>											
Unit Rate Volume	\$77.59 / cy	\$104.00 / cy	\$45.83 / cy	\$20.39 / cy	\$26.41 / cy	\$47.51 / cy	\$67.78 / cy	\$45.83 / cy			
Unit Rate Area	\$ 125,172 / acre-ft	\$ 167,792 / acre-ft	\$ 73,944 / acre	\$ 176,076 / acre	\$ 228,060 / acre	\$ 410,226 / acre	\$ 585,262 / acre	\$ 73,944 / acre			
Individual Maximum Cost	\$ 276,702,078	\$ 127,102,513	\$ 56,012,855	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039			
Case 3.2 Percentages	100%	25%	70%	100%	100%	100%	100%	100%			
Total 2007 Amended Remedy Cost	\$ 276,702,078	\$ 31,775,628	\$ 39,208,998	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 461,211,185	\$ 239,318,272	\$ 700,529,457

	Dredging Remedy for Primary Dredge	Dredging Remedy for Residual Dredge	Dredging Remedy for Residual Cover	Dredging in Designated Cap A Areas	Dredging in Designated Cap B Areas	Dredging in Designated Cap C Areas	Dredging in Designated Shoreline Capping Areas	Dredging in Designated Remedy Cover Areas	Dredging Remedy Sub Total	Balance of Dredging Remedy Project Budget	Total Dredging Remedy Project Budget
<b>Table 3: Dredging Remedy</b>											
Primary Dredging	\$ 276,702,078			\$ 123,069,402	\$ 44,752,510	\$ 69,473,582	\$ 10,116,211	\$ 24,658,843	\$ 548,772,627		
Residual Dredging		\$ 31,775,628		\$ 7,705,852	\$ 2,802,128	\$ 4,350,010	\$ 633,415	\$ 8,263,761	\$ 55,530,794		
Residual Covering			\$ 39,208,998	\$ 9,508,506	\$ 3,457,638	\$ 5,367,621	\$ 781,592	\$ 10,196,928	\$ 68,521,283		
Cost for 5.0 Years of Mob/Dem & Site Support				\$ 20,237,115	\$ 7,358,951	\$ 11,424,000	\$ 1,663,475	\$ 4,054,817	\$ 44,738,359		
Total Dredging Remedy Cost	\$ 276,702,078	\$ 31,775,628	\$ 39,208,998	\$ 160,520,875	\$ 58,371,227	\$ 90,615,214	\$ 13,194,694	\$ 47,174,348	\$ 717,563,063	\$ 239,318,272	\$ 956,881,335

	2007 Amended Remedy Primary Dredge vs Dredging Remedy	2007 Amended Remedy Residual Dredge vs Dredging Remedy	2007 Amended Remedy Residual Cover vs Dredging Remedy	2007 Amended Remedy Cap A vs Dredging Remedy	2007 Amended Remedy Cap B vs Dredging Remedy	2007 Amended Remedy Cap C vs Dredging Remedy	2007 Amended Remedy Shoreline Cap vs Dredging Remedy	2007 Amended Remedy Cover vs Dredging Remedy	2007 Amended Remedy vs Dredging Remedy Sub Total	Balance of Project Budget	Total Project Budget
<b>Table 4: 2007 Amended Remedy vs Dredging Remedy Variance</b>											
Cost Variance + / (-)	\$ 0	\$ 0	\$ 0	\$ (128,175,792)	\$ (43,136,796)	\$ (48,074,749)	\$ (4,357,232)	\$ (32,607,309)	\$ (256,351,878)	\$ 0	\$ (256,351,878)

	A Caps	B Caps	C Caps	Shore Line Caps	Remedy Covers	Total
<b>Table 5: Cap/Cover Remedy</b>						
Average Cap/Cover Thickness	13.3 inches	16.3 inches	33 inches	45 inches	9 inches	15 inches
Volume of Cap/Cover per Area	1,781 cy / acre	2,185 cy / acre	4,437 cy / acre	6,050 cy / acre	1,210 cy / acre	2,054 cy / acre
Rate of Placing Caps/Covers	50 cy / hr	50 cy / hr	45 cy / hr	40 cy / hr	50 cy / hr	49 cy / hr
Duration to Place Cap/Cover per Unit Area	35.6 hrs / acre	43.7 hrs / acre	98.6 hrs / acre	151.3 hrs / acre	24.2 hrs / acre	42.3 hrs / acre
Area to Cap/Cover	629.2 acres	228.8 acres	103.7 acres	15.1 acres	197.0 acres	1,173.8 acres
Total Cap/Cover Volume	1,120,850 cy	499,864 cy	460,082 cy	91,355 cy	238,370 cy	2,410,522 cy
Time to Cap/Cover	22,417 hours	9,997 hours	10,224 hours	2,284 hours	4,767 hours	49,690 hours

	1.00 spreader unit	2.00 spreader units	3.00 spreader units
<b>Note: Available Remediation Time =</b>	2,688 hours/calendar year		
	This assumes 24 hours/day, 5 days/week, 28 weeks/calendar year, and an 80% efficiency.		
Time to Cap/Cover w/	8.3 years	3.7 years	2.8 years
Time to Cap/Cover w/	3.7 years	1.9 years	1.2 years
Time to Cap/Cover w/	3.8 years	1.9 years	1.3 years
Time to Cap/Cover w/	0.8 years	0.4 years	0.3 years
Time to Cap/Cover w/	1.8 years	0.9 years	0.6 years
Time to Cap/Cover w/	18.5 years	9.2 years	6.2 years

**Number of Simultaneous Cap/Cover Spreaders:** The number of Cap/Cover Spreaders operating simultaneously is expected to be 2. However, there could be periods of time that three spreaders could be operating simultaneously or that the project could only support 1 spreader. The reasons for limiting the number of spreaders operating simultaneously is due to availability of upland staging area and the amount of cap/cover material that could reasonably be trucked to the respective upland staging areas.

**Project Remedy Comparisons  
2007 Amended Remedy vs Dredging Remedy vs  
Cap/Cover Remedy  
Prepared by: The Boldt Company  
Dated: February 17, 2010**

37 B C D E F G H I J K L M 37  
38 38

39	<b>Table 6: Schedule Comparisons</b>	2007 Amended Remedy	Dredging Remedy	Cap/Cover Remedy with 1 Spreader Unit	Cap/Cover Remedy with 2 Spreader Units	Cap/Cover Remedy with 3 Spreader Units
40	Total Volume Dredged	3,871,925 cy	7,607,037 cy	706,000 cy	706,000 cy	706,000 cy
41	Volume Dredged per Time Unit	550,000 cy / yr	550,000 cy / yr	550,000 cy / yr	550,000 cy / yr	550,000 cy / yr
42	Time to Dredge Total Volume	7.0 yrs	13.8 yrs	1.3 yrs	1.3 yrs	1.3 yrs
43	Time to Cap & Sand Cover after Dredging	2.0 yrs	0.2 yrs	18.5 yrs	9.2 yrs	6.2 yrs
44	Time for Total Remediation	9.0 yrs	14.0 yrs	19.8 yrs	10.5 yrs	7.4 yrs
45	First Year of Remediation	2009	2009	2009	2009	2009
46	Last Year of Remediation	2017	2022	2028	2019	2015

49	<b>Table 7: Volume 2's Quantities Rearranged for Capping Remedy</b>	2007 Amended Remedy Primary Dredge	2007 Amended Remedy Residual Dredge	2007 Amended Remedy Residual Cover	2007 Amended Remedy Cap A	2007 Amended Remedy Cap B	2007 Amended Remedy Cap C	2007 Amended Remedy Shoreline Cap	2007 Amended Remedy Cover	2007 Amended Remedy Sub Total
50	Volume	923,500 cy	46,863 cy	82,158 cy	3,894,192 cy	1,416,070 cy	895,442 cy	130,387 cy	317,827 cy	7,706,438 cy
51	Area	154.3 acres	29.0 acres	50.9 acres	626.0 acres	227.7 acres	103.7 acres	15.1 acres	197.0 acres	1,323.8 acres

53	<b>Table 8: Capping Remedy</b>	Capping Remedy for Primary Dredge	Capping Remedy for Residual Dredge	Capping Remedy for Residual Cover	Capping in Designated Cap A Areas	Capping in Designated Cap B Areas	Capping in Designated Cap C Areas	Capping in Designated Shoreline Capping Areas	Capping in Designated Remedy Cover Areas	Capping Remedy Sub Total	Balance of Capping Remedy Project Budget	Total Capping Remedy Project Budget
54	Unit Rate Volume	\$77.59 / cy	\$104.00 / cy	\$45.83 / cy	\$20.39 / cy	\$26.41 / cy	\$47.51 / cy	\$67.78 / cy	\$45.83 / cy			
55	Unit Rate Area	\$ 125,172 / acre-ft	\$ 167,792 / acre-ft	\$ 73,944 / acre	\$ 176,076 / acre	\$ 228,060 / acre	\$ 410,226 / acre	\$ 585,262 / acre	\$ 73,944 / acre			
56	Individual Maximum Cost	\$ 71,650,507	\$ 25,890,320	\$ 11,409,615	\$ 110,231,528	\$ 51,918,698	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039			
57	Case 3.2 Percentages	100%	25%	70%	100%	100%	100%	100%	100%		\$ (70,000,000)	
58	Total 2007 Amended Remedy Cost	\$ 71,650,507	\$ 6,472,580	\$ 7,986,731	\$ 110,231,528	\$ 51,918,698	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 314,205,010	\$ 169,318,272	\$ 483,523,282

60	<b>Table 9: 2007 Amended Remedy vs Capping Remedy Variance</b>	2007 Amended Remedy Primary Dredge vs Capping Remedy	2007 Amended Remedy Residual Dredge vs Capping Remedy	2007 Amended Remedy Residual Cover vs Capping Remedy	2007 Amended Remedy Cap A vs Capping Remedy	2007 Amended Remedy Cap B vs Capping Remedy	2007 Amended Remedy Cap C vs Capping Remedy	2007 Amended Remedy Shoreline Cap vs Capping Remedy	2007 Amended Remedy Cover vs Capping Remedy	2007 Amended Remedy vs Capping Remedy Sub Total	Balance of Project Budget	Total Project Budget
61	Cost Variance + / (-)	\$ 205,051,571	\$ 25,303,048	\$ 31,222,268	\$ (77,886,445)	\$ (36,684,267)	\$ 0	\$ 0	\$ 0	\$ 147,006,175	\$ 70,000,000	\$ 217,006,175

63	<b>Table 10: Mass Removal Comparison</b>	Dredging Remedy	Dredging Remedy as a percentage of Total RAL PCB Mass	2007 Amended Remedy	2007 Amended Remedy as a percentage of Total RAL PCB Mass	Capping Remedy	Capping Remedy as a percentage of Total RAL PCB Mass
64	RAL PCB Mass Removed	18,400 kg	86%	13,700 kg	64%	3,548 kg	17%
65	RAL PCB Mass Remaining	3,000 kg	14%	7,700 kg	36%	17,852 kg	83%
66		21,400 kg	100%	21,400 kg	100%	21,400 kg	100%

67 B C D E F G H I J K L M 67

**Project Remedy Comparisons  
2007 Amended Remedy vs Dredging Remedy vs Cap/Cover Remedy  
Prepared by: The Boldt Company  
Dated: January 28, 2010**

Table 1: All volumes, including cap and cover volumes, assumes 6 inches of overdredge.
Table 1: Rows 4 and 5 quantities are from Volume 2's 100% Design Report dated November 2009.
Table 2: Rows 8 and 9 unit rates are determined from Volume 2's Design Report dated November 2009
Table 2: C10 = C5 * C9 = Maximum possible primary dredging budget.
Table 2: C11 = Projected percentage of primary dredge area dredged.
Table 2: C12 = C10 * C11 = Projected primary dredging budget.
Table 2: D10 = C5 * D9 = Maximum possible residual dredging budget.
Table 2: D11 = Projected percentage of primary dredge area for residual dredging.
Table 2: D12 = D10 * D11 = Projected residual dredging budget.
Table 2: E10 = C5 * E9 = Maximum possible residual covering budget.
Table 2: E11 = Projected percentage of primary dredge area for residual covering.
Table 2: E12 = E10 * E11 = Projected residual covering budget.
Table 2: F10 = F5 * F9 = Maximum possible Cap A remediation budget.
Table 2: F11 = Projected percentage of Cap A to remediate.
Table 2: F12 = F10 * F11 = Projected Cap A remediation budget.
Table 2: G10 = G5 * G9 = Maximum possible Cap B Remediation budget.
Table 2: G11 = Projected percentage of Cap B to remediate.
Table 2: G12 = G10 * G11 = Projected Cap B remediation budget.
Table 2: H10 = H5 * H9 = Maximum possible Cap C Remediation budget.
Table 2: H11 = Projected percentage of Cap C to remediate.
Table 2: H12 = H10 * H11 = Projected Cap C remediation budget.
Table 2: I10 = I5 * I9 = Maximum possible Shoreline Cap Remediation budget.
Table 2: I11 = Projected percentage of Shoreline Cap to remediate.
Table 2: I12 = I10 * I11 = Projected Shoreline Cap remediation budget.
Table 2: J10 = J5 * J9 = Maximum possible Cover Remediation budget.
Table 2: J11 = Projected percentage of Cover to remediate.
Table 2: J12 = J10 * J11 = Projected Cover remediation budget.

Table 3: C19 = C12 = Projected primary dredging budget.
Table 3: D19 = D12 = Projected residual dredging budget.
Table 3: E19 = E12 = Projected residual covering budget.
Table 3: F15 = F4 * C8 * C11 = Cap A's primary dredging budget
Table 3: F16 = F5 * D9 * D11 = Cap A's residual dredging budget
Table 3: F17 = F5 * E9 * E11 = Cap A's residual covering budget
Table 3: F18 = F4 / (SUM(F4:J4)) * K18 = Cap A's mob/demob & site support budget
Table 3: F19 = SUM(F15:F18) = Cap A's total dredging remedy budget
Table 3: G15 = G4 * C8 * C11 = Cap B's primary dredging budget
Table 3: G16 = G5 * D9 * D11 = Cap B's residual dredging budget
Table 3: G17 = G5 * E9 * E11 = Cap B's residual covering budget
Table 3: G18 = G4 / (SUM(\$F4:\$J4)) * K18 = Cap B's mob/demob & site support budget
Table 3: G19 = SUM(G15:G18) = Cap B's total dredging remedy budget
Table 3: H15 = H4 * C8 * C11 = Cap C's primary dredging budget
Table 3: H16 = H5 * D9 * D11 = Cap C's residual dredging budget
Table 3: H17 = H5 * E9 * E11 = Cap C's residual covering budget
Table 3: H18 = H4 / (SUM(\$F4:\$J4)) * K18 = Cap C's mob/demob & site support budget
Table 3: H19 = SUM(H15:H18) = Cap C's total dredging remedy budget
Table 3: I15 = I4 * C8 * C11 = Shoreline Cap's primary dredging budget
Table 3: I16 = I5 * D9 * D11 = Shoreline Cap's residual dredging budget
Table 3: I17 = I5 * E9 * E11 = Shoreline Cap's residual covering budget
Table 3: I18 = I4 / (SUM(\$F4:\$J4)) * K18 = Shoreline Cap's mob/demob & site support budget
Table 3: I19 = SUM(I15:I18) = Shoreline Cap's total dredging remedy budget
Table 3: J15 = J4 * C8 * C11 = Cover's primary dredging budget
Table 3: J16 = J5 * D9 * D11 = Cover's residual dredging budget
Table 3: J17 = J5 * E9 * E11 = Covering's residual covering budget
Table 3: J18 = J4 / (SUM(\$F4:\$J4)) * K18 = Covering's mob/demob & site support budget
Table 3: J19 = SUM(J15:J18) = Cover's total dredging remedy budget
Table 3: K18 = Projected budget for extra years of (Mob/Demob + Site Support) - Cap LTMP
Table 4: Row 12 minus Row 19 = Variance between 2007 Amended Remedy and Dredging Remedy.

**Project Remedy Comparisons  
2007 Amended Remedy vs Dredging Remedy vs Cap/Cover Remedy  
Prepared by: The Boldt Company  
Dated: January 28, 2010**

Table 5: Row 25 = Average thickness of cap or cover.
Table 5: Row 26 = Row25 / 12 * 43560 / 27 = Average volume of Cap/Cover per area.
Table 5: Row 27 = Average rate of placing Cap/Cover.
Table 5: Row 28 = Row26 / Row27 = Average time to place Cap/Cover per area.
Table 5: Row 29 = Area to Cap/Cover.
Table 5: Row 30 = Row26 * Row29 = Total volume of Cap/Cover.
Table 5: Row 31 = Row28 * Row29 = Total time to Cap/Cover.
Table 5: Row 32 = Total calendar time available each year for remedial work.
Table 5: Row 33 = Row31 / Row32 / B33 = Time to Cap/Cover using 1 spreader.
Table 5: Row 34 = Row31 / Row32 / B34 = Time to Cap/Cover using 2 spreaders.
Table 5: Row 35 = Row31 / Row32 / B35 = Time to Cap/Cover using 3 spreaders.

Table 6: C40 = C4 + C5 * D11 * 43560 / 27 = Total volume dredged.
Table 6: C41 = Projected dredge volume processed each year.
Table 6: C42 = C40 / C41 = Number of years required to dredge all targeted volume.
Table 6: C43 = Years to cap and cover after dredging has been completed.
Table 6: C44 = SUM(C42:C43) = Total number of years required to remediate.
Table 6: C45 = First year of remediation.
Table 6: C46 = C45 - 1 + C44 = Last year of remediation.
Table 6: D40 = D4 + D5 * D11 * 43560 / 27 = Total volume dredged.
Table 6: D41 = Projected dredge volume processed each year.
Table 6: D42 = D40 / D41 = Number of years required to dredge all targeted volume.
Table 6: D43 = Years to cap and cover after dredging has been completed.
Table 6: D44 = SUM(D42:D43) = Total number of years required to remediate.
Table 6: D45 = First year of remediation.
Table 6: D46 = D45 - 1 + D44 = Last year of remediation.
Table 6: E40 = E4 + D5 * D11 * 43560 / 27 = Total volume dredged.
Table 6: E41 = Projected dredge volume processed each year.
Table 6: E42 = E40 / E41 = Number of years required to dredge all targeted volume.
Table 6: E43 = Years to cap and cover after dredging has been completed using 1 spreader.
Table 6: E44 = SUM(E42:E43) = Total number of years required to remediate.
Table 6: E45 = First year of remediation.
Table 6: E46 = E45 - 1 + E44 = Last year of remediation.
Table 6: F40 = F4 + D5 * D11 * 43560 / 27 = Total volume dredged.
Table 6: F41 = Projected dredge volume processed each year.
Table 6: F42 = F40 / F41 = Number of years required to dredge all targeted volume.
Table 6: F43 = Years to cap and cover after dredging has been completed using 2 spreader.
Table 6: F44 = SUM(F42:F43) = Total number of years required to remediate.
Table 6: F45 = First year of remediation.
Table 6: F46 = F45 - 1 + F44 = Last year of remediation.
Table 6: G40 = G4 + D5 * D11 * 43560 / 27 = Total volume dredged.
Table 6: G41 = Projected dredge volume processed each year.
Table 6: G42 = G40 / G41 = Number of years required to dredge all targeted volume.
Table 6: G43 = Years to cap and cover after dredging has been completed using 3 spreader.
Table 6: G44 = SUM(G42:G43) = Total number of years required to remediate.
Table 6: G45 = First year of remediation.
Table 6: G46 = G45 - 1 + G44 = Last year of remediation.

**Project Remedy Comparisons**  
**2007 Amended Remedy vs Dredging Remedy vs Cap/Cover Remedy**  
 Prepared by: The Boldt Company  
 Dated: January 28, 2010

Table 7: Summation of quantities are equal to Table 1 except total dredged is reduced to minimum required dredging and all undredged volume/areas are proportionately prorated to Cap Type 'A' and 'B'.
Table 8: Rows 54 and 55 unit rates are determined from Table 7 Quantities
Table 8: C56 = C50 * C54 = Maximum possible primary dredging budget.
Table 8: C57 = Projected percentage of primary dredge area dredged.
Table 8: C58 = C56 * C57 = Projected primary dredging budget.
Table 8: D56 = C51 * D55 = Maximum possible residual dredging budget.
Table 8: D57 = Projected percentage of primary dredge area for residual dredging.
Table 8: D58 = D56 * D57 = Projected residual dredging budget.
Table 8: E56 = C55 * E51 = Maximum possible residual covering budget.
Table 8: E57 = Projected percentage of primary dredge area for residual covering.
Table 8: E58 = E56 * E57 = Projected residual covering budget.
Table 8: F56 = F51 * F55 = Maximum possible Cap A remediation budget.
Table 8: F57 = Projected percentage of Cap A to remediate.
Table 8: F58 = F56 * F57 = Projected Cap A remediation budget.
Table 8: G56 = G51 * G55 = Maximum possible Cap B Remediation budget.
Table 8: G57 = Projected percentage of Cap B to remediate.
Table 8: G58 = G56 * G57 = Projected Cap B remediation budget.
Table 8: H56 = H51 * H55 = Maximum possible Cap C Remediation budget.
Table 8: H57 = Projected percentage of Cap C to remediate.
Table 8: H58 = H56 * H57 = Projected Cap C remediation budget.
Table 8: I56 = I51 * I55 = Maximum possible Shoreline Cap Remediation budget.
Table 8: I57 = Projected percentage of Shoreline Cap to remediate.
Table 8: I58 = I56 * I57 = Projected Shoreline Cap remediation budget.
Table 8: J56 = J51 * J55 = Maximum possible Cover Remediation budget.
Table 8: J57 = Projected percentage of Cover to remediate.
Table 8: J58 = J56 * J57 = Projected Cover remediation budget.
Table 9: Row 12 minus Row 58 = Variance between 2007 Amended Remedy and Capping Remedy.

Table 10: Estimated RAL PCB mass to be removed from and to remain in the river.
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**Summary Unit Costs**

Note: All volumes are with 6 inches of over dredge.

	B	C	D	E	F	G	H	I	J	K
		Primary Dredge	Residual Dredge	Residual Cover	Cap A	Cap B	Cap C	Cap SHC	Remedy Cover	Total
3										
4	Volume	3,566,400 cy	230,000 cy	403,333 cy	1,586,236 cy	576,813 cy	895,442 cy	130,387 cy	317,827 cy	7,706,438 cy
5	Area	757.5 acres	142.6 acres	250.0 acres	183.7 acres	66.8 acres	103.7 acres	15.1 acres	197.0 acres	1,323.8 acres

10/26/09 Tech Memo Unit Rates										
8	Unit Rate Volume	\$86.63 / cy	\$140.48 / cy	\$44.64 / cy	\$17.77 / cy	\$23.92 / cy	\$48.37 / cy	\$48.37 / cy	\$44.65 / cy	
9	Unit Rate Area	\$ 136,272 / acre-ft	\$ 226,637 / acre-ft	\$ 72,025 / acre	\$ 153,401 / acre	\$ 206,568 / acre	\$ 417,689 / acre	\$ 417,689 / acre	\$ 72,029 / acre	
10	Individual Maximum Cost	\$ 308,946,798	\$ 171,677,278	\$ 54,558,771	\$ 28,179,713	\$ 13,798,722	\$ 43,314,399	\$ 6,307,111	\$ 14,189,667	
11	Case 3 Percentages	100%	20%	56%	100%	100%	100%	100%	100%	
12	Case 3 Cost	\$ 308,946,798	\$ 34,335,456	\$ 30,552,912	\$ 28,179,713	\$ 13,798,722	\$ 43,314,399	\$ 6,307,111	\$ 14,189,667	\$ 479,624,777
13	100% Des. Report Budget	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
14	Case 3 Variance + / (-)	\$ (20,283,446)	\$ (10,414,682)	\$ (12,066,821)	\$ 4,165,371	\$ 1,435,709	\$ (773,934)	\$ 2,530,350	\$ 377,372	\$ (35,030,080)
15	Break Even Depth				1.14 ft	1.54 ft	3.11 ft	3.11 ft	0.54 ft	
16	Case 3.1 Percentages	100%	16%	55%	100%	100%	100%	100%	100%	
17	Case 3.1 Cost	\$ 308,946,798	\$ 27,468,364	\$ 30,007,324	\$ 28,179,713	\$ 13,798,722	\$ 43,314,399	\$ 6,307,111	\$ 14,189,667	\$ 472,212,099
18	100% Des. Report Budget	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
19	Case 3.1 Variance + / (-)	\$ (20,283,446)	\$ (3,547,590)	\$ (11,521,233)	\$ 4,165,371	\$ 1,435,709	\$ (773,934)	\$ 2,530,350	\$ 377,372	\$ (27,617,402)
20	Break Even Depth				1.17 ft	1.57 ft	3.18 ft	3.18 ft	0.55 ft	
21	Case 3.2 Percentages	100%	25%	70%	100%	100%	100%	100%	100%	
22	Case 3.2 Cost	\$ 308,946,798	\$ 42,919,320	\$ 38,191,140	\$ 28,179,713	\$ 13,798,722	\$ 43,314,399	\$ 6,307,111	\$ 14,189,667	\$ 495,846,869
23	100% Des. Report Budget	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
24	Case 3.2 Variance + / (-)	\$ (20,283,446)	\$ (18,998,546)	\$ (19,705,049)	\$ 4,165,371	\$ 1,435,709	\$ (773,934)	\$ 2,530,350	\$ 377,372	\$ (51,252,172)
25	Break Even Depth				1.10 ft	1.48 ft	2.98 ft	2.98 ft	0.51 ft	

100% Budget Unit Rates										
28	Unit Rate Volume	\$77.59 / cy	\$104.00 / cy	\$45.83 / cy	\$20.39 / cy	\$26.41 / cy	\$47.51 / cy	\$67.78 / cy	\$45.83 / cy	
29	Unit Rate Area	\$ 125,172 / acre-ft	\$ 167,792 / acre-ft	\$ 73,944 / acre	\$ 176,076 / acre	\$ 228,060 / acre	\$ 410,226 / acre	\$ 585,262 / acre	\$ 73,944 / acre	
30	Individual Maximum Cost	\$ 276,702,078	\$ 127,102,513	\$ 56,012,855	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	
31	Case 3 Percentages	100%	20%	56%	100%	100%	100%	100%	100%	
32	Case 3 Cost	\$ 276,702,078	\$ 25,420,503	\$ 31,367,199	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 447,014,259
33	100% Des. Report Budget	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
34	Case 3 Variance + / (-)	\$ 11,961,274	\$ (1,499,729)	\$ (12,881,108)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (2,419,562)
35	Break Even Depth				1.47 ft	1.91 ft	3.43 ft	4.89 ft	0.62 ft	
36	Case 3.1 Percentages	100%	16%	55%	100%	100%	100%	100%	100%	
37	Case 3.1 Cost	\$ 276,702,078	\$ 20,336,402	\$ 30,807,070	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 441,370,030
38	100% Des. Report Budget	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
39	Case 3.1 Variance + / (-)	\$ 11,961,274	\$ 3,584,372	\$ (12,320,979)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,224,667
40	Break Even Depth				1.48 ft	1.91 ft	3.44 ft	4.91 ft	0.62 ft	
41	Case 3.2 Percentages	100%	25%	70%	100%	100%	100%	100%	100%	
42	Case 3.2 Cost	\$ 276,702,078	\$ 31,775,628	\$ 39,208,998	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 461,211,185
43	100% Des. Report Budget	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
44	Case 3.2 Variance + / (-)	\$ 11,961,274	\$ (7,854,854)	\$ (20,722,908)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (16,616,488)
45	Break Even Depth				1.48 ft	1.92 ft	3.46 ft	4.93 ft	0.62 ft	

**Summary Unit Costs**

	B	C	D	E	F	G	H	I	J	K
	Note: All volumes are with 6 inches of overredge.									
3		<b>Primary Dredge</b>	<b>Residual Dredge</b>	<b>Residual Cover</b>	<b>Cap A</b>	<b>Cap B</b>	<b>Cap C</b>	<b>Cap SHC</b>	<b>Remedy Cover</b>	<b>Total</b>
4	<b>Volume</b>	3,566,400 cy	230,000 cy	403,333 cy	1,586,236 cy	576,813 cy	895,442 cy	130,387 cy	317,827 cy	7,706,438 cy
5	<b>Area</b>	757.5 acres	142.6 acres	250.0 acres	183.7 acres	66.8 acres	103.7 acres	15.1 acres	197.0 acres	1,323.8 acres
47	<b>A/OT Estimate Unit Rates</b>									
48										
49	<b>Unit Rate Volume</b>	\$51.92 / cy	\$51.92 / cy	\$54.01 / cy	\$20.03 / cy	\$23.62 / cy	\$49.33 / cy	\$69.60 / cy	\$54.01 / cy	
50	<b>Unit Rate Area</b>	\$ 83,759 / acre-ft	\$ 83,759 / acre-ft	\$ 87,130 / acre	\$ 173,000 / acre	\$ 204,000 / acre	\$ 426,000 / acre	\$ 601,000 / acre	\$ 87,130 / acre	
51	<b>Individual Maximum Cost</b>	\$ 185,155,846	\$ 63,447,443	\$ 66,000,975	\$ 31,780,100	\$ 13,627,200	\$ 44,176,200	\$ 9,075,100	\$ 17,164,610	
52	<b>Case 3 Percentages</b>	100%	20%	56%	100%	100%	100%	100%	100%	
53	<b>Case 3 Cost</b>	\$ 185,155,846	\$ 12,689,489	\$ 36,960,546	\$ 31,780,100	\$ 13,627,200	\$ 44,176,200	\$ 9,075,100	\$ 17,164,610	\$ 350,629,090
54	<b>100% Des. Report Budget</b>	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
55	<b>Case 3 Variance + / (-)</b>	\$ 103,507,506	\$ 11,231,286	\$ (18,474,455)	\$ 564,984	\$ 1,607,231	\$ (1,635,735)	\$ (237,639)	\$ (2,597,571)	\$ 93,965,607
56	<b>Break Even Depth</b>				2.05 ft	2.42 ft	5.05 ft	7.13 ft	1.03 ft	
57	<b>Case 3.1 Percentages</b>	100%	16%	55%	100%	100%	100%	100%	100%	
58	<b>Case 3.1 Cost</b>	\$ 185,155,846	\$ 10,151,591	\$ 36,300,536	\$ 31,780,100	\$ 13,627,200	\$ 44,176,200	\$ 9,075,100	\$ 17,164,610	\$ 347,431,183
59	<b>100% Des. Report Budget</b>	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
60	<b>Case 3.1 Variance + / (-)</b>	\$ 103,507,506	\$ 13,769,183	\$ (17,814,446)	\$ 564,984	\$ 1,607,231	\$ (1,635,735)	\$ (237,639)	\$ (2,597,571)	\$ 97,163,514
61	<b>Break Even Depth</b>				2.05 ft	2.42 ft	5.06 ft	7.13 ft	1.03 ft	
62	<b>Case 3.2 Percentages</b>	100%	25%	70%	100%	100%	100%	100%	100%	
63	<b>Case 3.2 Cost</b>	\$ 185,155,846	\$ 15,861,861	\$ 46,200,683	\$ 31,780,100	\$ 13,627,200	\$ 44,176,200	\$ 9,075,100	\$ 17,164,610	\$ 363,041,599
64	<b>100% Des. Report Budget</b>	\$ 288,663,352	\$ 23,920,774	\$ 18,486,091	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 8,837,461	\$ 14,567,039	\$ 444,594,697
65	<b>Case 3.2 Variance + / (-)</b>	\$ 103,507,506	\$ 8,058,913	\$ (27,714,592)	\$ 564,984	\$ 1,607,231	\$ (1,635,735)	\$ (237,639)	\$ (2,597,571)	\$ 81,553,098
66	<b>Break Even Depth</b>				2.05 ft	2.42 ft	5.05 ft	7.12 ft	1.03 ft	

100% Budget

Comparison of Current Cost Estimate to BODR January 2010 Note: Current estimate from 12/18/09 Email Revised Project Cost Estimate with Comparison to the BODR Submittal.

Category	BODR 2005 USD	BODR 2009 USD	Current Estimate 2009 USD	Variance (Current - BODR) 2009 USD	Current Direct Dredging 2009 USD	Current Direct Cap 2009 USD	Current Direct Cover 2009 USD
I.1.2 Mob/Demob mechanical dredge	205,873	224,077					
I.1.3 Mob/Demob hydraulic dredge	12,452,596	13,553,674					
I.1.4 Mob/Demob Capping Equip	1,631,818	1,776,106					
SOV 8 Mob/Demob			44,851,333				
Mob/Demob	14,290,287	15,553,857	44,851,333	29,297,476	0	0	0
II.1.1 Mechanical debris removal	2,541,272	2,765,975					
CO 4,5,6 Debris removal			3,849,510				
Debris Removal	2,541,272	2,765,975	3,849,510	1,083,535	0	0	0
II.2.3 Mechanical dredging	579,016	630,214					
II.2.2 Hydraulic dredging	33,266,842	36,208,349					
II.3.3 Sediment processing Non-TSCA	99,338,198	108,121,839					
II.4.2 Sed Disposal NR 500 C&O	67,581,129	73,556,759					
II.3.1 Beneficial reuse	6,140,336	6,683,274					
SOV15 OU2/3 DDTD			28,308,328		28,308,328		
SOV 16 OU4 Non-TSCA DDTD			235,204,160		235,204,160		
Non-TSCA Dredging, Dewatering, Transport & Disposal	206,905,521	225,200,435	263,512,488	38,312,053	263,512,488	0	0
II.2.1 TSCA dredging & disposal	24,893,522	27,094,647					
II.3.2 Dewatering treatment of TSCA sed.	5,836,516	6,352,590					
SOV 17 TSCA DDTD			25,150,864		25,150,864		
TSCA Dredging, Dewatering, Transport & Disposal	30,730,038	33,447,237	25,150,864	(8,296,373)	25,150,864	0	0
I.2.1 Site Prep - Shell prop OU4	30,186,973	32,856,153					
IV.1 Engineering and Design	10,000,000	10,884,216					
SOV 1 Field investigations			712,000				
SOV 2 Agency coordination			756,922				
SOV 3 Public involvement			301,943				
SOV 5 Staging/access property lease			16,594,426				
SOV 6 Site historic surveys			1,157,000				
SOV 7 Remedial design			4,910,130				
SOV 8.1 Insurance			17,650,841				
SOV 9 Submittals			189,310				
SOV 10 Infrastructure			51,077,067				
SOV 11 Bathymetric survey			21,779,768				
Design and Infrastructure	40,186,973	43,740,369	115,129,407	71,389,038	0	0	0
II.5.1 Mechanical capping - OU3	10,795,603	11,750,167					
II.5.2 Mechanical capping OU4	18,275,143	19,891,060					
SOV 20 Engineered caps			81,491,684			81,491,684	0
SOV 21 Sand covers			33,053,130		18,486,091		14,567,039
Engineered Caps	29,070,746	31,641,227	114,544,814	82,903,587	18,486,091	81,491,684	14,567,039
II.5.3 Shoreline capping OU3	755,216	821,993					
II.5.3 Shoreline capping OU4	2,502,560	2,723,840					
SOV 20.4 Shoreline caps			8,469,626			8,469,626	0
Shoreline Caps	3,257,776	3,545,833	8,469,626	4,923,793	0	8,469,626	0
II.5.4 Residual cover OU3	1,455,730	1,584,448					
II.5.4 Residual cover OU4	9,339,255	10,165,047					
Residual Cover	10,794,985	11,749,495	0	(11,749,495)	0	0	0
Residual Dredging OU3			15,016,048		15,016,048		
Residual Dredging OU4			8,904,726		8,904,726		
Residual Dredging	0	0	23,920,774	23,920,774	23,920,774	0	0
III.1.1 Construction monitoring & surveys	4,417,535	4,808,140					
III.1.2 Contractor CQ/monitoring	32,736,584	35,631,205					
I.4.1 Construction work plans	531,000	577,952					
SOV 12.1 Agency coordination & reporting			595,326				
SOV 12.2 Community health & safety			3,938,525				
SOV 12.3 Construction monitoring (environ)			5,454,564				
SOV 12.4 Construction monitoring (perform)			14,032,823				
SOV 23 EPA closeout & record retention			1,287,052				
Regulatory Compliance	37,685,119	41,017,297	25,308,290	(15,709,007)	0	0	0
IV.2 Construction support	9,124,360	9,931,150					
SOV 28 Site Support			52,472,143				
Site Support	9,124,360	9,931,150	52,472,143	42,540,993	0	0	0
SOV 29 Value engineering			685,512				
VE / Reuse	0	0	685,512	685,512	0	0	0
CO36 Escalation			0				
Contract Escalation	0	0	0	0	0	0	0
III.1.3 Long-term monitoring	11,934,554	12,989,826					
Long-term monitoring			18,422,216			8,996,131	
Long-term monitoring	11,934,554	12,989,826	18,422,216	5,432,390	0	8,996,131	0
VE shared savings payout			18,480				
VE shared savings payout			2,394,000				
VE shared savings payout			1,800,000				
Shared Savings Payout Total	0	0	4,212,480	4,212,480	0	0	0
<b>Total Project Costs</b>	<b>396,521,631</b>	<b>431,582,701</b>	<b>700,529,457</b>	<b>268,946,756</b>	<b>331,070,217</b>	<b>98,957,441</b>	<b>14,567,039</b>
<b>Adjusted Project Costs</b>	<b>396,521,631</b>	<b>431,582,701</b>	<b>700,529,457</b>	<b>268,946,756</b>	<b>331,070,217</b>	<b>98,957,441</b>	<b>14,567,039</b>
		108.84%	162.32%				

Notes:

- This table presents a comparison to the Final BODR dated 16 June 2006.
- Current estimate based on Tetra Tech's 28 September 2009 cash flow plus adjustments for area / volume changes based on TT cap and cover analysis. An escalation adjustment has been apportioned to the applicable items. The adjustment assumes constant inflation at the current year's rate for future years.
- Inflation adjustment calculated using the US Bureau of Labor Statistics CPI - All Urban Consumers (series ID CUUR0000SA0). Inflation calculated from January 2006 to August 2009.
- The BODR reported long-term monitoring as a net present value (NPV). PCC back-calculated the 2005 USD costs for long term monitoring and maintenance from the BODR's cost estimating back up and replaced the NPV with a 2005 USD cost.

5. Below are the volumes for each estimate. Current estimate volumes derived from the 100% Design Draft, dated 17 November 2009.

	BODR 2009 USD	Current Estimate 2009 USD (1)	Variance (Current - BODR) 2009 USD
TSCA (in situ dredged)	200,000 cy	170,000 cy	(30,000) cy
Non-TSCA (in situ dredged)	3,486,000 cy	3,626,400 cy	140,400 cy
TSCA for disposal	270,000 tons	93,806 tons	(176,194) tons
Non-TSCA for disposal	1,815,000 tons	2,170,796 tons	355,796 tons
Cap and Cover Estimated sand volumes	1,266,797 tons	1,851,135 tons	584,338 tons
Cap Estimated stone volumes	574,435 tons	736,366 tons	161,931 tons

(1) Yardage for Non-TSCA (in-situ dredged) is from Table 9-1 of the 100% Design Report and the Non-TSCA for disposal tonnage is prorated from the yardage from Table 4-1 of the 100% Design Report. Table 4-1 and 9-1 in-situ cubic yards did not match up because Table 9-1 had 230,000 cyd of residual dredging plus and additional 5,000 cyd (source unknown).

Portions prepared by Project Control Companies, Inc.

100% Quantities

**Table 4-1 Summary of Dredge Volumes by OU**  
(Page 50 of Volume 2's 100 Design Report - November 2009)

OU	2009		2010 to 2017		Total (2009 to 2017)	
	Volume (a,b)	Area	Volume (a)	Area	Volume (a)	Area
OU2	4,800 cy	0.6 acres	0 cy	0.0 acres	4,800 cy	0.6 acres
OU3	75,100 cy	32.3 acres	110,400 cy	47.0 acres	185,500 cy	79.3 acres
OU4/5	371,600 cy	57.6 acres	2,999,500 cy	620.0 acres	3,371,100 cy	677.6 acres
<b>Total</b>	<b>451,500 cy</b>	<b>90.5 acres</b>	<b>3,109,900 cy</b>	<b>667.0 acres</b>	<b>3,561,400 cy</b>	<b>757.5 acres</b>

a. All volumes are based on required design including a 6-inch overdredge allowance.  
 b. OU2 RA was performed in accordance with the refined design presented in the RD Technical Memorandum - OU2 Remedial Design Refinement, dated June 11, 2009, approved by the A/DT on June 12, 2009. This RA required dredging of the reduced volume of sediment shown.  
 c. Actual dredge volumes for 2009 were 541,216 cubic yards, which included additional dredge areas approved in the Phase 2B Work Plan for 2009 RA and residual dredging.

**Table 9-1 Anticipated Dredging Production Rates, 2009 through Completion**  
(Page 134 of Volume 2's 100 Design Report - November 2009)

Year	Annual Dredge Production (a,b)		Total Annual Dredge Production (d)
	Non-TSCA	TSCA	Total
2009 (c)	531,200 cy	10,000 cy	541,200 cy
2010	530,000 cy	20,000 cy	550,000 cy
2011	530,000 cy	20,000 cy	550,000 cy
2012	510,000 cy	40,000 cy	550,000 cy
2013	510,000 cy	40,000 cy	550,000 cy
2014	510,000 cy	40,000 cy	550,000 cy
2015	505,200 cy	0 cy	505,200 cy
<b>Total</b>	<b>3,626,400 cy</b>	<b>170,000 cy</b>	<b>3,796,400 cy</b>

a. Based on 24 hours per day, 5 days per week operation at 65 percent efficiency  
 b. Includes required dredging and 6-inch overdredge allowance, as well as an estimated 230,000 cy of residual dredging.  
 c. Volume represents actual dredge quantity for 2009. Details on 2009 dredging quantities were provided in the 100 percent Design Report Volume 1 and the Phase 2B Work Plan for 2009 RA.  
 d. All quantities are approximate and subject to refinement in the annual Phase 2B work Plans for RA.

**Table 6-6 Summary of Cap Delineation**  
(Page 90 of Volume 2's 100 Design Report - November 2009)

OU	Cap A	Cap B	Cap C	Total of Cap A, B, C	Shoreline Caps (a)
OU2 (b,c)	5.3 acres	0.4 acres	0.0 acres	5.7 acres	0.0 acres
OU3 (c)	34.6 acres	14.6 acres	0.0 acres	49.2 acres	0.0 acres
OU4/5 (c)	143.8 acres	51.8 acres	103.7 acres	299.3 acres	15.1 acres
<b>Total (c)</b>	<b>183.7 acres</b>	<b>66.8 acres</b>	<b>103.7 acres</b>	<b>354.2 acres</b>	<b>15.1 acres</b>

a. Shoreline capping will be necessary in those areas where dredging will adversely impact the stability of existing slopes. Areas presented above are preliminary estimates, subject to further RD engineering evaluations, including a location-specific review of these areas during subsequent designs presented in the annual RA Work Plans.  
 b. Capping in OU2 was completed in 2009. Therefore the areas presented above represent actual acres capped.  
 c. All areas are approximate and represent preliminary construction limits aimed at ensuring complete coverage of the minimum required cap area delineated by the geostatistical modeling with a LOS of 0.5 defining the extents of sediment requiring remediation. Actual areas may vary from these limits based on operational considerations and limitations. See Section 6.5 for additional details.

**Table 9-2 Area of Cap Placement by Year, 2009 through Completion (a)**  
(Page 135 of Volume 2's 100 Design Report - November 2009)

Year	Cap A (b)	Cap B (b)	Cap C (b)	Shoreline Cap (b)
2009	0.3 acres	0.4 acres	0.0 acres	0.0 acres
2010	36.4 acres	14.6 acres	0.0 acres	0.0 acres
2011	6.1 acres	2.0 acres	6.6 acres	0.0 acres
2012	7.2 acres	15.1 acres	16.6 acres	0.0 acres
2013	29.7 acres	10.8 acres	18.4 acres	0.0 acres
2014	17.4 acres	7.5 acres	26.7 acres	0.0 acres
2015	33.2 acres	0.9 acres	35.1 acres	0.0 acres
2016	41.4 acres	11.9 acres	0.4 acres	0.0 acres
2017	14.2 acres	3.8 acres	0.0 acres	15.1 acres
<b>Total</b>	<b>185.9 acres</b>	<b>67.0 acres</b>	<b>103.8 acres</b>	<b>15.1 acres</b>

Notes:  
 All areas are approximate and represent preliminary construction limits aimed at ensuring complete coverage of the minimum required cap area as defined by the geostatistical model output. Actual cap areas may vary from these limits based on operational considerations and limitations. See section 6.5 for additional details. See Table 6-7 for a summary of cap designs.

**Summary of Sand Cover Delineation**  
 Figures: 1-5a,b,c,d - 2010 to 2017 Engineered Capping and Sand Cover Areas  
 (Pages 24 to 27 and 126 of Volume 2's 100 Design Report - November 2009)

OU	Area
OU2	0.0 acres
OU3	62.4 acres
OU4/5	134.6 acres
<b>Total</b>	<b>197.0 acres</b>

**Table 9-3 Area of Sand Cover Placement by Year, 2009 through Completion (a)**  
(Page 135 of Volume 2's 100 Design Report - November 2009)

Year	Sand Cover as Primary RA	Post-Dredge Residuals Sand Cover (b)
2009	24.3 acres	11.0 acres
2010	51.3 acres	30.0 acres
2011	19.0 acres	60.0 acres
2012	19.3 acres	30.0 acres
2013	24.0 acres	0.0 acres
2014	6.0 acres	67.0 acres
2015	7.1 acres	26.0 acres
2016	27.0 acres	26.0 acres
2017	16.0 acres	0.0 acres
<b>Total</b>	<b>194.0 acres</b>	<b>250.0 acres</b>

Notes:  
 a. All areas are approximate and represent preliminary construction limits aimed at ensuring complete coverage of the minimum required sand cover areas as defined by the geostatistical model output. Actual sand cover areas may vary from these limits based on operational considerations and limitations.  
 b. Post-dredge residual sand cover area is estimate only based on experience during the 2009 construction season. Actual areas requiring sand cover to be determined during construction based on post-dredge verification sampling.

100% Budget Unit Costs

ROD Remedy Dredge			
	Volumes w/overdredge (1)	Areas (2)	Average Depth
OU2-3	797,000 cy	236.6 acres	2.1 ft
OU4-5	6,762,000 cy	913.0 acres	4.6 ft
Total	7,559,000 cy	1,149.6 acres	4.1 ft

(1) Table ES-1 (page 7) of BODR  
 (2) Table 2-12 (page 40) of BODR except OU2 is from current configuration

2007 Amended Remedy Dredge				2007 Amended Remedy Cap			2007 Amended Remedy Cover		
	Volumes w/overdredge (1, 2)	Areas	Average Depth	Volumes w/overdredge	Areas (3)	Average Depth	Volumes w/overdredge	Areas	Average Depth
OU2-3	228,000 cy	117.2 acres	1.2 ft	569,000 cy	52.9 acres	6.7 ft	107,287 cy	66.5 acres	1.0 ft
OU4-5	3,458,000 cy	484.0 acres	4.4 ft	3,304,000 cy	285.5 acres	7.2 ft	231,513 cy	143.5 acres	1.0 ft
Total	3,686,000 cy	601.2 acres	3.8 ft	3,873,000 cy	338.4 acres	7.1 ft	338,800 cy	210.0 acres	1.0 ft

(1) Table ES-1 (page 7) of BODR  
 (2) Table 2-12 (page 40) of BODR except OU2 is from current configuration  
 (3) Table 2 (page 14), Attachment B-1 of 60% Design Report for OU4; Terri Blackmar's 8/28/09 email for OU3; current configuration for OU2

100% Remedy Dredge				100% Remedy Cap			100% Remedy Cover & Residual Cover		
	Volumes w/overdredge (1)	Areas	Average Depth	Volumes w/overdredge	Areas (2)	Average Depth	Volumes w/overdredge	Areas (3)	Average Depth
OU2-3	200,300 cy	79.9 acres	1.6 ft	368,252 cy	54.9 acres	4.2 ft	228,448 cy	141.6 acres	1.0 ft
OU4-5	3,596,100 cy	677.6 acres	3.3 ft	2,811,288 cy	314.4 acres	5.5 ft	492,712 cy	305.4 acres	1.0 ft
Total	3,796,400 cy	757.5 acres	3.1 ft	3,179,540 cy	369.3 acres	5.3 ft	721,160 cy	447.0 acres	1.0 ft

(1) Table 4-1 (page 50) and Table 9-1 (page 134) of 100% Volume 2 Design  
 (2) Table 6-6 (page 90) and Table 9-2 of 100% Volume 2 Design  
 (3) Table 9-3 (page 135) of 100% Volume 2 Design

Dredge Summary Table: Areas, volumes and costs are from Volume 2's 100 % Design Report - November 2009 Tables 4-1, 9-1 and 11-1						
	Dredge Non-TSCA	Residual Dredge	Residual Dredging compared to 1st Pass Dredging	Dredge plus Residual Dredge	TSCA	Total
Area	757.5 acres	142.6 acres	19%	900.1 acres	37.9 acres	757.5 acres
Volume	3,396,400 cy	230,000 cy	7%	3,626,400 cy	170,000 cy	3,796,400 cy
Cost w/ Residual Cover	\$ 263,512,488	\$ 23,920,774	9%	\$ 287,433,262	\$ 25,150,864	\$ 312,584,126
Cost / Area	\$ 347,871 /acre	\$ 167,792 /acre		\$ 319,348 /acre	\$ 663,346 /acre	\$ 412,652 /acre
Cost / Volume	\$ 77.59 /cy	\$ 104.00 /cy	134%	\$ 79.26 /cy	\$ 147.95 /cy	\$ 82.34 /cy
Average Depth of Dredging	Dredge Depth 2.78 ft	Dredge Depth 1.00 ft		Dredge Depth 2.50 ft	Dredge Depth 2.78 ft	Dredge Depth 3.11 ft
Cost / Area-Depth	\$ 125,172 /acre-ft	\$ 167,792 /acre-ft	134%	\$ 127,875 /acre-ft	\$ 238,687 /acre-ft	\$ 132,837 /acre-ft

Dredge Summary Table: Areas, volumes and costs are from Volume 2's 100 % Design Report - November 2009 Tables 4-1, 9-1 and 11-1						
	Dredge Non-TSCA	Residual Dredge	Residual Dredging compared to 1st Pass Dredging	Dredge plus Residual Dredge & Cover	TSCA	Total
Area	757.5 acres	142.6 acres	19%	900.1 acres	37.9 acres	757.5 acres
Volume	3,396,400 cy	230,000 cy	7%	3,626,400 cy	170,000 cy	3,796,400 cy
Cost w/ Residual Cover	\$ 281,998,579	\$ 23,920,774	8%	\$ 305,919,353	\$ 25,150,864	\$ 331,070,217
Cost / Area	\$ 372,275 /acre	\$ 167,747 /acre		\$ 339,873 /acre	\$ 663,346 /acre	\$ 437,056 /acre
Cost / Volume	\$ 83.03 /cy	\$ 104.00 /cy	125%	\$ 84.36 /cy	\$ 147.95 /cy	\$ 87.21 /cy
Average Depth of Dredging	Dredge Depth 2.78 ft	Dredge Depth 1.00 ft		Dredge Depth 2.50 ft	Dredge Depth 2.78 ft	Dredge Depth 3.11 ft
Cost / Area-Depth	\$ 133,953 /acre-ft	\$ 167,792 /acre-ft	125%	\$ 136,099 /acre-ft	\$ 238,687 /acre-ft	\$ 140,693 /acre-ft

Cap Summary Table: Areas, volumes and costs are from Volume 2's 100 % Design Report - November 2009 Tables 6-6, 9-2 and 11-1						
	Cap A	Cap B	Cap C	Total for Caps A+B+C	Shoreline Caps	Total All Caps
Area	183.7 acres	66.8 acres	103.7 acres	354.2 acres	15.1 acres	369.3 acres
Volume	1,586,236 cy	576,813 cy	895,442 cy	3,058,490 cy	130,387 cy	3,188,878 cy
Cost (1)	\$ 32,345,084	\$ 15,234,431	\$ 42,540,465	\$ 90,119,980	\$ 8,837,461	\$ 98,957,441
Cost / Area	\$ 176,076 /acre	\$ 228,060 /acre	\$ 410,226 /acre	\$ 254,432 /acre	\$ 585,262 /acre	\$ 267,959 /acre
Cost / Volume	\$ 20.39 /cy	\$ 26.41 /cy	\$ 47.51 /cy	\$ 29.47 /cy	\$ 67.78 /cy	\$ 31.03 /cy
Average Depth of Dredging	Dredge Depth 5.4 ft					
Cost / Area-Depth						
Break-Even Dredge Depth w/ Residual Dredging	Dredge Depth 1.38 ft	Dredge Depth 1.78 ft	Dredge Depth 3.21 ft	Dredge Depth 1.99 ft	Dredge Depth 4.58 ft	Dredge Depth 2.10 ft
Break-Even Dredge Depth w/ Residual Dredging & Covering	Dredge Depth 1.29 ft	Dredge Depth 1.68 ft	Dredge Depth 3.01 ft	Dredge Depth 1.87 ft	Dredge Depth 4.30 ft	Dredge Depth 1.97 ft

(1) Cost for Caps includes Long Term Monitoring of the Caps prorated between caps.

Sand Cover Summary Table: Areas, volumes and costs are from Volume 2's 100 % Design Report - November 2009 Tables 9-3 and 11-1			
	Remedy Sand Cover	Residual Cover	Total Cover
Area	197.0 acres	250.0 acres	447.0 acres
Volume	317,827 cy	403,333 cy	721,160 cy
Cost	\$ 14,567,039	\$ 18,486,091	\$ 33,053,130
Cost / Area	\$ 73,944 /acre	\$ 73,944 /acre	\$ 73,944 /acre
Cost / Volume	\$ 45.83 /cy	\$ 45.83 /cy	\$ 45.83 /cy
Average Depth of Dredging	Dredge Depth 1.0 ft	Dredge Depth 1.0 ft	Dredge Depth 1.0 ft
Cost / Area-Depth			
Break-Even Dredge Depth	Dredge Depth 0.6 ft	Dredge Depth 0.6 ft	Dredge Depth 0.6 ft

10-26-09 Cap-Cover Unit Costs

Table 1 (Dredge versus Cap Cost Analysis for OU2/3 and OU4 dated October 26, 2009)  
 Cap Cost Analyses  
 Lower Fox River OUs 2 - 5  
 (Not contractual cost - used for estimating only)

Type A Cap Analysis											
Type A Caps	Average Sand Thickness (inches)	Sand Volume Needed per Acre (cy)	Sand Cost (\$/cy)	Average Gravel Thickness (inches)	Gravel Volume Needed per Acre (cy)	Gravel Cost (\$/cy)	Cap Material & Transportation Cost (\$/Acre)	Cap Installation Cost (\$/Acre)	Total Cap Construction Cost (\$/Acre)	LT Cap Maintenance (\$/Acre)	Total Cap Cost with LTM (\$/Acre)
A1	9	1,210	\$17.23	15	2,017	\$20.61	\$62,412	\$138,750	\$201,162	\$5,540	\$206,701
A2	9	1,210	\$17.23	10	1,344	\$20.61	\$48,557	\$100,208	\$148,766	\$4,097	\$152,862
A3	9	1,210	\$17.23	10	1,344	\$20.61	\$48,557	\$100,208	\$148,766	\$4,097	\$152,862

Type B Cap Analysis											
Type B Caps	Average Sand Thickness (inches)	Sand Volume Needed per Acre (cy)	Sand Cost (\$/cy)	Average Gravel Thickness (inches)	Gravel Volume Needed per Acre (cy)	Gravel Cost (\$/cy)	Cap Material & Transportation Cost (\$/Acre)	Cap Installation Cost (\$/Acre)	Total Cap Construction Cost (\$/Acre)	LT Cap Maintenance (\$/Acre)	Total Cap Cost with LTM (\$/Acre)
B1	12	1,613	\$17.23	15	2,017	\$20.61	\$69,361	\$190,225	\$259,586	\$7,149	\$266,735
B2	12	1,613	\$17.23	10	1,344	\$20.61	\$55,507	\$144,933	\$200,440	\$5,520	\$205,960
B3	12	1,613	\$17.23	10	1,344	\$20.61	\$55,507	\$144,933	\$200,440	\$5,520	\$205,960

Type C and Shoreline Cap Analysis														
Type of Cap	Average Sand Thickness (inches)	Sand Volume Needed per Acre (cy)	Sand Cost (\$/cy)	Average Gravel Thickness (inches)	Gravel Volume Needed per Acre (cy)	Gravel Cost (\$/cy)	Quarry Spall Armor Thickness (inches)	Quarry Spall Armor Volume per Acre (cy)	Quarry Spall Armor Cost (\$/cy)	Cap Material & Transportation Cost (\$/Acre)	Cap Installation Cost (\$/Acre)	Total Cap Construction Cost (\$/Acre)	LT Cap Maintenance (\$/Acre)	Total Cap Cost with LTM (\$/Acre)
C1	12	1,613	\$17.23	9	1,210	\$20.61	21	2,823	\$20.17	\$ 109,682	\$ 274,974	\$ 384,656	\$ 10,593	\$ 395,249
OU 3/4A Shoreline	12	1,613	\$17.23	9	1,210	\$20.61	33	4,437	\$20.17	\$ 142,223	\$ 419,796	\$ 562,019	\$ 12,711	\$ 574,731
OU 4B Shoreline	12	1,613	\$17.23	9	1,210	\$20.61	31	4,168	\$20.17	\$ 136,800	\$ 419,796	\$ 556,596	\$ 12,711	\$ 569,307

Sand and Residual Cover Analysis						
Type of Cap	Average Sand Thickness (inches)	Sand Volume Needed per Acre (cy)	Sand Cost (\$/cy)	Cap Material & Transport Cost (\$/Acre)	Cap Install Cost (\$/Acre)	Total Cap Cost (\$/Acre)
Remedy Sand Cover	9	1,210	\$17.23	\$20,848	\$51,186	\$72,034
Residual Cover	9	1,210	\$17.23	\$20,848	\$51,176	\$72,025

- Notes: 1. Cap thicknesses shown above are from the 60 Percent Design Report.  
 2. Cap installation costs are from the proposal by J.F. Brennan Company.  
 3. Blue shading indicates data that is input. All other values are calculated.  
 4. Sand density is assumed to be 114 pcf wet (1.54 tons/cy).  
 5. Gravel density is assumed to be 119.3 pcf wet (1.61 tons/cy).  
 6. Quarry spall density is assumed to be 116.7 pcf (1.58 tons/cy).  
 7. Cap material costs include taxes.

10-26-09 Cap-Cover Unit Costs

A Caps				LT Monitoring - A Caps					
100% Des Rep Quantities for "A" Caps			100% Des Rep Quantities with 10/26/09 Tech Memo Unit Rates Total Cost	100% Des Rep Budget	Variance + / (-)	10/26/09 Tech Memo LT Cap Maintenance	100% Des Rep Budget	LT Cap Maintenance Variance + / (-)	
10/26/09 Tech Memo Unit Rates	Percent of Total 'A' Cap	Cap A Areas							
\$206,701 / acre	A1	1%	1.8 acres	\$ 379,710		\$ 10,176	\$ 29,405	\$ 19,228	
\$152,862 / acre	A2	9%	16.5 acres	\$ 2,527,273		\$ 67,731	\$ 264,642	\$ 196,910	
\$152,862 / acre	A3	90%	165.3 acres	\$ 25,272,729		\$ 677,314	\$ 2,646,416	\$ 1,969,102	
	<b>Total Cap A</b>		<b>183.7 acres</b>	<b>\$ 28,179,713</b>	<b>\$32,345,084</b>	<b>\$ 4,165,371</b>	<b>\$ 755,222</b>	<b>\$ 2,940,462</b>	<b>\$ 2,185,240</b>

B Caps				LT Monitoring - B Caps					
100% Des Rep Quantities for "B" Caps			100% Des Rep Quantities with 10/26/09 Tech Memo Unit Rates Total Cost	100% Des Rep Budget	Variance + / (-)	10/26/09 Tech Memo LT Cap Maintenance	100% Des Rep Budget	LT Cap Maintenance Variance + / (-)	
10/26/09 Tech Memo Unit Rates	Percent of Total 'B' Cap	Cap B Areas							
\$266,735 / acre	B1	1%	0.7 acres	\$ 178,179		\$ 4,775	\$ 13,849	\$ 9,074	
\$205,960 / acre	B2	9%	6.0 acres	\$ 1,238,231		\$ 33,185	\$ 124,645	\$ 91,460	
\$205,960 / acre	B3	90%	60.1 acres	\$ 12,382,312		\$ 331,848	\$ 1,246,453	\$ 914,605	
	<b>Total Cap B</b>		<b>66.8 acres</b>	<b>\$ 13,798,722</b>	<b>\$15,234,431</b>	<b>\$ 1,435,709</b>	<b>\$ 369,809</b>	<b>\$ 1,384,948</b>	<b>\$ 1,015,140</b>

C & SHC Caps				LT Monitoring - C & SHC Caps					
100% Des Rep Quantities for "C" and Shoreline (SHC) Caps			100% Des Rep Quantities with 10/26/09 Tech Memo Unit Rates Total Cost	100% Des Rep Budget	Variance + / (-)	10/26/09 Tech Memo LT Cap Maintenance	100% Des Rep Budget	LT Cap Maintenance Variance + / (-)	
10/26/09 Tech Memo Unit Rates	Percent of Total Cap 'C' & Shoreline Cap	Cap C and Shoreline Cap Areas							
\$395,249 / acre	C1	100%	103.7 acres	\$ 40,987,300	\$42,540,465	\$ 1,553,165	\$ 1,098,468	\$ 3,867,315	\$ 2,768,847
\$574,731 / acre	OU 3/4A SHC	46%	6.9 acres	\$ 3,992,079	\$ 4,065,232	\$ 73,153	\$ 88,293	\$ 369,567	\$ 281,274
\$569,307 / acre	OU 4B SHC	54%	8.2 acres	\$ 4,642,131	\$ 4,772,229	\$ 130,098	\$ 103,648	\$ 433,839	\$ 330,191
	<b>Total C &amp; SHC</b>		<b>118.8 acres</b>	<b>\$ 49,621,510</b>	<b>\$51,377,926</b>	<b>\$ 1,756,416</b>	<b>\$ 1,290,409</b>	<b>\$ 4,670,721</b>	<b>\$ 3,380,312</b>

Cap Summary				LT Monitoring - Cap Summary				
	Total A Caps	183.7 acres	\$ 28,179,713	\$32,345,084	\$ 4,165,371	\$ 755,222	\$ 2,940,462	\$ 2,185,240
	Total B Caps	66.8 acres	\$ 13,798,722	\$15,234,431	\$ 1,435,709	\$ 369,809	\$ 1,384,948	\$ 1,015,140
	Total C Caps	103.7 acres	\$ 40,987,300	\$42,540,465	\$ 1,553,165	\$ 1,098,468	\$ 3,867,315	\$ 2,768,847
	Total SHC OU4A	6.9 acres	\$ 3,992,079	\$ 4,065,232	\$ 73,153	\$ 88,293	\$ 369,567	\$ 281,274
	Total SHC OU4B	8.2 acres	\$ 4,642,131	\$ 4,772,229	\$ 130,098	\$ 103,648	\$ 433,839	\$ 330,191
	<b>Total all Caps</b>	<b>369.3 acres</b>	<b>\$ 91,599,945</b>	<b>\$98,957,441</b>	<b>\$ 7,357,496</b>	<b>\$ 2,415,439</b>	<b>\$ 8,996,131</b>	<b>\$ 6,580,692</b>

Remedy Sand and Residual Covers						
100% Des Rep Quantities for Sand Cover and Residual Cover			100% Des Rep Quantities with 10/26/09 Tech Memo Unit Rates Total Cost	100% Des Rep Budget	Variance + / (-)	
10/26/09 Tech Memo Unit Rates	Percent of Total Cover	Area				
\$72,034 / acre	Remedy Sand Cover	100%	197.0 acres	\$ 14,190,665	\$14,567,039	
\$72,025 / acre	Residual Cover	100%	250.0 acres	\$ 18,006,195	\$18,486,091	
	<b>Total Cover</b>		<b>447.0 acres</b>	<b>\$ 32,196,860</b>	<b>\$33,053,130</b>	<b>\$ 856,270</b>